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Folding rack

The present invention relates to a folding rack for receiving and transporting bags to be received in the rack, which for their part are provided for receiving objects to be transported and/or stored, having a base part and lateral frame parts which are connected articulatedly to the base part at their lower end and are pivotal about approximately 90° or more in relation to the base part, from a position perpendicular to the base part into a position substantially parallel to the base part.

A rack of this kind is known for example from German Offenlegungsschrift No. 41 38 507. In the known rack, a rigid upper frame part and a rigid lower frame part are each provided so that there can be suspended from the upper rigid frame part, which is partly in the form of parallel rails, rods which can be displaced on these rails and have flexible material webs hanging therefrom. The side parts are defined by four corner posts which have in the centre an articulation point and are each connected articulatedly to the upper frame part and the lower frame part so that the posts can each be bent at their centre and in this way the entire rack can be folded up.

The known rack is, however, provided such that it may only be folded up in the empty condition – that is to say without the bags received in the rack. Moreover, the known rack is relatively complicated to manufacture, since each individual post has to have a total of three different hinge points, namely a hinge opposite the lower frame part, a hinge opposite the upper frame part, and in addition a bending point in the centre of the post.

Against the background of this prior art, the object of the present invention is to provide a folding rack which is simpler in construction and easier to manufacture.

This object is achieved in that there is articulated to the upper end region of the lateral frame parts a cross strut which is pivotal in relation to the lateral frame part in the direction of an opposing cross strut, into a position substantially parallel to the base part, with the free ends of the cross struts pivoted toward one another being connectable to one another in a substantially rigid manner so that the upper ends of the side parts, which are connected by the cross struts articulated thereto and rigidly connected to one another, are held at a minimum spacing defined by the cross struts.

In the case of the subject of the present invention, moreover, the side parts preferably substantially comprise two parallel, mutually connected corner posts, although each of the corner

posts now has only two articulation points, namely an articulation point for connecting it to the base part and an articulation point in the upper region for connecting it to the cross strut. Once the side parts have been set up, the cross struts of the opposing side parts are pivoted toward one another and connected to one another in an overlapping connection region.

In the preferred embodiment of the invention, it is provided in this case for the free ends of the cross struts to engage in one another and to be held together in substantially rigid manner by a pipe clamp reaching over the engagement region.

In this case, furthermore, in the preferred embodiment of the invention the pipe clamp is held resiliently on one of the cross struts and pretensioned in the direction of the region of connection between the two cross struts, so that when the two free ends of the cross struts are pivoted toward one another they first engage in one another, and the resiliently pretensioned pipe clamp is at the same time first deflected in opposition to the resilient pretension and then snaps back and reaches over the connection point, so that it holds the two ends of the cross struts together.

In this way, a rigid connection is achieved between the two cross struts in a relatively simple manner, and hence a rigid connection between the two side parts is also achieved provided the articulated connection between the cross struts and the side parts does not allow any relative displacement in relation to the cross struts in this unfolded position.

Particularly preferred is an embodiment of the invention in which there extend between the side parts flexible material webs which, when the side parts are set up, extend horizontally between opposing side parts and are tensioned by the upright side parts. These flexible material webs then, for their part, exert a tensile force on the side parts and draw the side parts toward one another, while the cross struts ensure a minimum spacing between the side parts and hence fix the position of the side parts unambiguously. Preferably, a plurality of material webs are tensioned in parallel between the side parts, and preferably the material webs running transversely are also connected to one another by generally vertical or indeed inclined connection webs so that receiving bags for objects are formed between the tensioned horizontal material webs and the connection webs extending between them.

The cross struts are in this case preferably dimensioned such that in the unfolded condition of the side parts the latter extend substantially parallel to one another and perpendicular to the base part, with the corner posts which define the side parts moreover being aligned with corresponding corner posts of the base part so that the unfolded racks can be stacked on top of one another.

In this case, the articulation regions of the cross struts are preferably arranged on the side parts or the posts thereof such that the upper ends of the posts remain free and the upper ends of the corner posts of the side parts and the lower ends of the corner posts of the base parts are preferably constructed such that they engage in one another when a plurality of racks are stacked on top of one another and hence are prevented from being displaced laterally.

In the preferred embodiment of the invention, the upper ends of the corner posts of the base part are similar in construction to the upper ends of the corner posts of the side parts and moreover the side parts or corner posts of the side parts are articulated to the corner posts of the base parts such that when the rack is in the folded-up condition, with the side parts folded underneath, the upper ends of the corner posts of the base parts are exposed. The corner posts of the base parts are in this case generally relatively short post parts which extend substantially perpendicular to the plane otherwise defined by the base part. This construction makes it possible to stack the folded-up racks on top of one another as well.

To fold them up, or in other words to fold in the side parts, it may moreover be advantageous if the cross struts articulated to the upper regions of the side parts or the corner posts of the side parts are pivotal into a position parallel to the side parts and next to the side parts or the corner posts of the side parts, and may be locked thereto. It is equally possible to fold up the rack by pivoting the cross struts into a position in which they extend more or less as a prolongation of the side parts or the corner posts of the side parts.

In this case, moreover, it is advantageous to articulate the cross struts to the corner posts of the side parts such that one of the parts has a pivot pin defining an axis and the other of the parts is received thereon by means of a slot, so that the cross strut or the corresponding other part may be displaced on the pin by way of the slot and hence certain positions of the cross struts may be locked relative to the side parts.

Other advantages, features and possible applications of the present invention will become apparent from the description which follows of preferred embodiments in the attached drawings, in which:

Figures 1a – e show sketches of the principle of a folding rack in various positions,

Figures 2a – e show a similar embodiment to that of Figure 1, but with bags suspended in the rack, in similar positions of unfolding to those in Figures 1a – e,

Figure 3 shows the cross struts in isolation,

Figure 4 shows a sketch to illustrate the way opposing cross struts are connected,

Figure 5 shows details of the connection between the upper region of corner posts of side parts and the cross struts,

Figure 6 shows a series of drawings showing how the rack according to the invention is set up, and

Figure 7 shows a series of drawings showing how the rack is folded up.

Visible in Figure 1 and shown in side view is the base part 1, with short corner posts 2 joined laterally thereto, side parts 3, 4 and cross struts 5 and 6 articulated to the side parts 3 and 4 respectively.

It will be understood that in the diagrammatic side view illustrated in Figure 1 only the front edges of the base part and the side parts are in each case visible, and these are preferably formed by cross struts and corner posts which generally comprise rectangular tubes. It can clearly be visualized that the same elements are duplicated in a plane behind the plane of the paper and that they are connected to the elements in the plane of the paper, parallel thereto, by struts or the like and so, taken as a whole, form the rack.

In Figure 1, the rack is completely folded up. A particular feature to be noted here is that the cross strut 5 is unfolded in such a way that it is virtually a prolongation of the side part 3 and lies over the side parts 4, while the cross strut 6 is folded back parallel to the side part 4 and is preferably locked thereto.

In Figure 1b, the left-hand side part 3 has been set up. In Figure 1c, in addition, the right-hand side part has also been set up, while the cross struts have retained their original position in relation to the side parts 3 and 4, the position they had in the folded-up condition.

In Figure 1d, the cross struts 5, 6 have been pivoted toward one another and engage with one another by their free ends. Here, a pipe clamp 7 is visible, mounted resiliently on the cross strut 6 and deflected somewhat as the two free ends of the cross struts 5, 6 are pushed inside one another, snapping back only in the position illustrated in Figure 1e and hence reaching over the

two mutually connected ends of the cross struts 5, 6. In this way, the cross struts 5, 6 are held rigidly together by the pipe clamp 7 reaching over them. It will be understood that all that has to be done to fold up the rack is to push the pipe clamp 7 to the right in opposition to the force of the resilient pretension so that the two ends of the cross struts 5, 6 can be moved apart again and the rack then folded up in the reverse order.

Figures 2a – e show precisely the same sequence of folding up a rack, in this case the rack differing from the rack in Figure 1 only in that there are now parallel webs 8 of a flexible material extending between the two side parts 3, 4, and these webs 8 are, for their part, connected to one another by vertical connection webs 9 so that substantially rectangular bags are formed between the horizontal webs 8 and the vertical webs 9. In the folded-up condition, in accordance with Figures 2a and 2b, the bags are still loosely folded up, hanging between the two side parts 3, 4, or they lie on the base part 1. When the side parts 3, 4 are set up, the horizontal webs 8 are tensioned, reaching their full tension when the two cross struts 5, 6 are brought together and connected rigidly to one another, so that they keep the two side parts 3, 4 at a predetermined minimum spacing which is dimensioned such that in this condition the material webs 8 are tensioned just sufficiently to be taut. Moreover, the cross struts are also dimensioned such that in this condition the two side parts 3, 4 or the corner posts thereof extend substantially parallel and vertically with respect to the plane of the base part and precisely in a prolongation of the short corner posts 2 of the base part.

Figure 3 shows the two cross struts 5 and 6 in isolation, with the cross strut 5 in Figures 1 and 2 being articulated to the side part 3 visible on the left, while the cross strut 6 is articulated to the opposing right-hand side part 4. It will be seen that the two cross struts 5, 6 each have a slot 15 and 16 respectively, although the slot 15 of the cross strut 5 extends in the longitudinal direction of the cross strut 5, whereas the slot 16 of the cross strut 6 extends in the transverse end limb of the cross strut 6. This differing arrangement of the slots is associated with the desired differences in the end positions which the cross struts 5, 6 can adopt relative to the side parts 3 and 4 in accordance with Figures 1 and 2. The corresponding mechanism will be indicated more clearly in Figure 5.

Figure 4 shows the way the two cross struts 5, 6 are connected at their free ends. In the present example, the cross strut 5 is provided with a widened end portion in which the end portion of the cross strut 6 can engage fittingly. Moreover, the cross strut 6 is provided with a pipe clamp 7 which is held resiliently on the cross strut 6. When the two free ends of the cross struts 5, 6 are pushed together, the cross strut 6 engages in the open end of the cross strut 5, and the end of the cross strut 5 at the same time pushes the pipe clamp 7 back somewhat, in opposition to the

resilient pretension thereof. As soon as the cross struts 5, 6 have reached the mutually flush position illustrated in Figures 1e and 2e, the pipe clamp 7 snaps back out of its resiliently pretensioned position and in so doing reaches over part of the end portion of the cross strut 5 as well, so that a rigid connection is made between these two parts.

Figure 5 shows, in the left-hand part of the figure, both the corner post of the side part 3 and the cross strut 5 mounted articulatedly thereon. The side part 3, or the corner post thereof, is provided with a holding part which is U-shaped in cross-section and between the limbs of which a pivot pin 12 extends. The pivot pin 12 at the same time extends through a slot in the cross strut 5 which runs in the longitudinal direction of the cross strut 5. In the position illustrated top left in Figure 5, the cross strut 5 is pivotal in relation to the side part 3 about the pin 12. However, if, in the position illustrated top left in Figure 5, the cross strut 5 is displaced downward so that the pin runs up the slot, then the cross strut 5 abuts against the side part 3 by means of a portion lying below the pivot pin, and cannot be pivoted – or at least only about a small angle. This relative position is illustrated in Figures 1a – c and Figures 2a – c. Once the cross strut 5 has been pulled up into the position illustrated top left in Figure 5, however, the cross strut 5 can be pivoted into the position illustrated bottom left in Figure 5. Because of the end limb additionally joined onto the cross strut 5, however, this end limb also finally abuts against the side part 3 and so defines the illustrated position, in which the cross strut 5 extends substantially perpendicular to the side part 3.

The cross strut 6, visible on the right in Figure 5, may similarly be locked in its position aligned perpendicular to the side part 4 (top right in Figure 5) as a result of the pivot pin, here too, being displaced in a slot into a position in which the end limb of the cross strut 6 abuts against the side part 4. In this case, the slot extends perpendicular to the longitudinal direction of the cross strut 6 in the end limb joined onto the end of the cross strut 6. In the position of the pin in the slot which is illustrated at the bottom of Figure 5, the cross strut 6 is pivotal in relation to the side part 4.

Figure 6 shows, in a series of individual drawings 1 – 12, how the folded-up rack can be set up and put into the end position illustrated for example in Figure 2e. The procedure here corresponds substantially to that already described in connection with Figures 1 and 2.

Figure 7 shows a series of individual drawings showing how the rack is folded up. Here, the only point to note is that, as can be seen for example from parts 1 and 2 of Figure 7, the pipe clamp 7 has to be withdrawn and disengaged from the free end of the cross strut 5 so that the cross strut 5 can be pivoted upward and disengaged from the free end of the cross strut 6. All the other

procedures correspond simply to a reversal of the procedures described in Figures 1a – e and 2a – e.

Also important is the fact that the side parts can if possible also be locked to the vertical corner posts 2 of the base part 1 so that the side parts 3, 4 can be held substantially upright once set up even if the cross struts are not yet connected and even if they cannot hence put the flexible webs 8 of the bags under sufficient pretension yet.

As can be seen from parts 6 and 8 of Figure 7, the corner posts of the side parts 3 and 4 are pushed into the corresponding corner posts 2 of the base part and can be unlocked at the same time by way of a cross strut which connects two corner posts of each side part to one another. As is furthermore visible from Figure 5, the upper ends of the corner posts of the side parts 3 and 4 are widened and substantially correspond in their cross-section to the cross-section of the corner posts 2 of the base part 1. By contrast, the lower ends of the corner posts 2 of the base part 1 or additional, joined-on parts on the base part 1 which are aligned with the corner posts 2 substantially correspond in their cross-section to the corner posts of the side parts 3 and 4, so that these lower ends of the corner posts 2 or the corresponding joined-on parts can be inserted fittingly into the widened portions of the corner posts of the side parts 3 and 4, as illustrated in Figure 5. This makes it possible to stack the folding racks on top of one another both in the set-up condition, that is to say in the unfolded condition, and in the folded-up condition. Among other things, the fact that the cross struts 5, 6 are articulated below the upper free ends of the corner posts of the side parts 3 and 4 to the latter makes it possible to stack them on top of one another in the unfolded condition as well.